# MATHS

## BOOKS - RD SHARMA MATHS (ENGLISH)

## ADJOINTS AND INVERSE OF MATRIX

Others

**1.** Find the non-singular matrices $A$, if its is given that $adj(A) = \begin{bmatrix} -1 & -2 & 1 \\ 3 & 0 & -3 \\ 1 & -4 & 1 \end{bmatrix}$

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**2.** If A is a non-singular matrix, prove that: $adjA$ is also non -singular $(adjA)^{-1} = \frac{1}{|A|}A.$

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**3.** If $A$ is a non-singular matrix, prove that $(adjA)^{-1} = (adjA^{-1})$.

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**4.** Find the matrix A such that

$$|A| = 2 \, and \, adj(A) = \begin{bmatrix} 2 & 2 & 0 \\ 2 & 5 & 1 \\ 0 & 1 & 1 \end{bmatrix}$$

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**5.** If A is a square matrix of order 3 such that $|A| = 2$, then write the value of $adj(adjA)$.

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**6.** If A is a square matrix of order 3 such that $|A|$ =3, then find the value of $|adj(adjA)|$.

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**7.** Compute the adjoint of the matrix A given by $A = \begin{bmatrix} 1 & 4 & 5 \\ 3 & 2 & 6 \\ 0 & 1 & 0 \end{bmatrix}$ and verify that $A(adjA) = |A|I = (AdjA)A$.

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**8.** Find the inverse of the matrix

$$A = \begin{bmatrix} 8 & 4 & 2 \\ 2 & 9 & 4 \\ 1 & 2 & 8 \end{bmatrix}$$

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**9.** If $A$ is a square matrix of order $n$, prove that

$$|AadjA| = |A|^n$$

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**10.** Find the adjoint of matrix $A = [a_{ij}] = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 1 & -3 \\ -1 & 2 & 3 \end{bmatrix}$

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**11.** For the matrix $A = \begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$, find $x$ and $y$ sot that $A^2 + xI + yA = 0$ Hence, Find $A^{-1}$.

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12. Show that the matrix $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ satisfies the equation $A^2 - 4A - 5I_3 = 0$ and hence find $A^{-1}$

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13. If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha & 0 \\ \sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$, find $adj\dot{A}$ and verify that $A\left(adj\dot{A}\right) = \left(adj\dot{A}\right)A = |A|I_3$.

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**14.** If $A = \begin{bmatrix} 1 & \tan x \\ -\tan x & 1 \end{bmatrix}$, show that $A^T A^{-1} = \begin{bmatrix} \cos 2x & -\sin 2x \\ \sin 2x & \cos 2x \end{bmatrix}$

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**15.** If matrix $A = [02yzxy - zx - yz]$ satisfies

AT = A-1, then find the value of x, y, z.

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**16.** Find a $2x2$ matrix B such that $B[1-214]=[6006]$

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**17.** Find the matrix $A$ satisfying the matrix equation $[2132]A[-325-3]=[1001]$

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**18.** If A is a symmetric matrix, write whether $A^T$ is symmetric or skew-symmetric.

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**19.** Using elementary row transformation find the inverse of the matrix $A = [3 - 1 - 220 - 13 - 50]$

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**20.** Let $A$ be a non-singular matrix. Show that $A^T A^{-1}$ is symmetric if $A^2 = \left(A^T\right)^2$

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**21.** If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ is such that $A^T = A^{-1}$, find $\alpha$

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**22.** Find the adjoint of matrix $A = [a_{ij}] = \begin{bmatrix} p & q \\ r & s \end{bmatrix}$.

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**23.** Find the adjoint of matrix $A = [a_{ij}] = \begin{vmatrix} 1 & 1 & 1 \\ 2 & 1 & -3 \\ -1 & 2 & 3 \end{vmatrix}$.

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**24.** Compute the adjoint of the matrix $A$ given by $A = \begin{bmatrix} 1 & 4 & 5 \\ 3 & 2 & 6 \\ 0 & 1 & 0 \end{bmatrix}$ and verify that $A(adj\ A) = |A|I = (adj\ A)A$.

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**25.** Find the inverse of the matrix $\begin{vmatrix} 2 & -1 \\ 3 & 4 \end{vmatrix}$.

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26. Find the inverse of the matrix $A = \begin{bmatrix} 8 & 4 & 2 \\ 2 & 9 & 4 \\ 1 & 2 & 8 \end{bmatrix}$.

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27. If $A$ is an invertible matrix of order 3 and $|A| = 5$, then find $|adj\ A|$.

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**28.** If $A$ is an invertible matrix of order $3 \times 3$ such that $|A| = 2$. Then, find $|adj\ A|$.

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**29.** If $A$ is an square matrix of order $3$ such that $|A| = 2$, then write the value of $|(adj\ A)|$.

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**30.** If $A = \begin{vmatrix} 3 & 0 & -1 \\ 2 & 3 & 0 \\ 0 & 4 & 1 \end{vmatrix}$, then find $|adj\ (adj\ A)|$

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**31.** If $A = \begin{vmatrix} a & b \\ c & d \end{vmatrix}$, find $adj\ A$ .

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32. If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha & 0 \\ \sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$, find $adj\ A$ and verify that $A(adj\ A) = (adj\ A)A = |A|I_3$

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33. If $A = \begin{vmatrix} 2 & 3 \\ 5 & -2 \end{vmatrix}$, show that $A^{-1} = \frac{1}{19}A$.

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34. Find the inverse of $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$ and verify that $A^{-1}A = I_3$.

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35. If $A = \begin{vmatrix} 1 & \tan x \\ -\tan x & 1 \end{vmatrix}$, show that $A^T A^{-1} = \begin{vmatrix} \cos 2x & -\sin 2x \\ \sin 2x & \cos 2x \end{vmatrix}$.

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**36.** If $A = \begin{vmatrix} 3 & 2 \\ 7 & 5 \end{vmatrix}$ and $B = \begin{vmatrix} 6 & 7 \\ 8 & 9 \end{vmatrix}$, verify that $(AB)^{-1} = B^{-1}A^{-1}$.

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**37.** Show that $A = \begin{vmatrix} 2 & -3 \\ 3 & 4 \end{vmatrix}$ satisfies the equation $x^2 - 6x + 17 = 0$. Hence, find $A^{-1}$.

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**38.** For the matrix $A = \begin{vmatrix} 3 & 1 \\ 7 & 5 \end{vmatrix}$, find $x$ and $y$ so that $A^2 + xI = yA$.

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**39.** For the matrix $A = \begin{bmatrix} 3 & 2 \\ 1 & 1 \end{bmatrix}$, find the numbers $a$ and $b$ such that $A^2 + aA + bI = O$. Hence, find $A^{-1}$.

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**40.** Show that the matrix $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ satisfies the equation $A^2 - 4A - 5I_3 = O$ and hence find $A^{-1}$.

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**41.** If $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & -1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$, show that $A^{-1} = A^2$

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**42.** Find a $2 \times 2$ matrix $B$ such that $B\begin{bmatrix} 1 & -2 \\ 1 & 4 \end{bmatrix} = \begin{bmatrix} 6 & 0 \\ 0 & 6 \end{bmatrix}$.

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**43.** Find the matrix $A$ satisfying the matrix equation $\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$.

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**44.** Find the matrix $X$ for which $\begin{bmatrix} 1 & -4 \\ 3 & -2 \end{bmatrix} X = \begin{bmatrix} -16 & -6 \\ 7 & 2 \end{bmatrix}$.

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**45.** If $A = \begin{bmatrix} 0 & 1 & 3 \\ 1 & 2 & x \\ 2 & 3 & 1 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1/2 & -4 & 5/2 \\ -1/2 & 3 & -3/2 \\ 1/2 & y & 1/2 \end{bmatrix}$ ,find $x$, $y$.

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**46.** If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ is such that $A^T = A^{-1}$, find $\alpha$.

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**47.** If matrix $A = \begin{bmatrix} 0 & 2 & y \\ z & x & y \\ -z & x-y & z \end{bmatrix}$ satisfies $A^T = A^{-1}$, find $x,\ y,\ z$.

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**48.** Find the matrix $A$ such that $|A| = 2$ and

$$adj\, A = \begin{bmatrix} 2 & 2 & 0 \\ 2 & 5 & 1 \\ 0 & 1 & 1 \end{bmatrix}.$$

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**49.** If $A$ is a non-singular matrix, prove that: $adj\,(A)$ is also non-singular (ii) $(adj\, A)^{-1} = \frac{1}{|A|} A.$

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**50.** If $A$ is a non-singular matrix, prove that $(adj\ A)^{-1} = (adj\ A^{-1})$.

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**51.** Find the non-singular matrices $A$ , if it is given that $adj\ (A) = [-1 - 2130 - 31 - 41]$.

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52. If $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$, find $(adj\ A)^{-1}$ and $(adj\ A^{-1})$.

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53. Let $A$ be a non-singular matrix. Show that $A^T A^{-1}$ is symmetric iff $A^2 = (A^T)^2$.

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**54.** Find the adjoint of the following matrices: $\begin{bmatrix} -3 & 5 \\ 2 & 4 \end{bmatrix}$ Verify that $(adj\ A)A = |A|I = A(adj\ A)$ for the above matrices.

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**55.** Find the adjoint of the following matrices: $\begin{bmatrix} \cos\alpha & \sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ (ii) $\begin{bmatrix} 1 & \tan\alpha/2 \\ -\tan\alpha/2 & 1 \end{bmatrix}$

Verify that $(adj\ A)A = |A|I = A(adj\ A)$ for the above matrices.

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56. Compute the adjoint of each of the following matrices: $\begin{bmatrix}1 & 2 & 2\\ 2 & 1 & 2\\ 2 & 2 & 1\end{bmatrix}$ (ii) $\begin{bmatrix}1 & 2 & 5\\ 2 & 3 & 1\\ -1 & 1 & 1\end{bmatrix}$ (iii) $\begin{bmatrix}2 & -1 & 3\\ 4 & 2 & 5\\ 0 & 4 & -1\end{bmatrix}$ (iv) $\begin{bmatrix}2 & 0 & -1\\ 5 & 1 & 0\\ 1 & 1 & 3\end{bmatrix}$ Verify that $(adj\ A)A = |A|I = A(adj\ A)$ for the above matrices.

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**57.** For the matrix $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 3 & 0 \\ 18 & 2 & 10 \end{bmatrix}$, show that $A(adj\ A) = O$.

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**58.** If $A = \begin{bmatrix} -4 & -3 & -3 \\ 1 & 0 & 1 \\ 4 & 4 & 3 \end{bmatrix}$, show that $adj\ A = A$.

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**59.** If $A = \begin{bmatrix} -1 & -2 & -2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$, show that $adj\ A = 3A^T$.

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**60.** Find $A(adj\ A)$ for the matrix $A = \begin{bmatrix} 1 & -2 & 3 \\ 0 & 2 & -1 \\ -4 & 5 & 2 \end{bmatrix}$.

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**61.** Find the inverse of the following matrix:

$$\begin{vmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{vmatrix}$$

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**62.** Find the inverse of $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \\ 3 & 1 & 2 \end{bmatrix}$.

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**63.** Find the inverse of $\begin{bmatrix} 1 & 2 & 5 \\ 1 & -1 & -1 \\ 2 & 3 & -1 \end{bmatrix}$

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**64.** Find the inverse of $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$

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**65.** Find the inverse of $\begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$

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**66.** Find the inverse of $\begin{bmatrix} 0 & 1 & -1 \\ 4 & -3 & 4 \\ 3 & -3 & 4 \end{bmatrix}$

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**67.** Find the inverse of $\begin{bmatrix} 0 & 0 & -1 \\ 3 & 4 & 5 \\ -2 & -4 & -7 \end{bmatrix}$

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**68.** Find the inverse of $\begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\alpha & \sin\alpha \\ 0 & \sin\alpha & -\cos\alpha \end{bmatrix}$

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69. Find the inverse following matrix and verify that $A^{-1}A = I_3$ . $\begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$

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70. Find the inverse following matrix and verify that $A^{-1}A = I_3$ . $\begin{bmatrix} 2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2 \end{bmatrix}$

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**71.** For the following pair of matrix verify that $(AB)^{-1} = B^{-1}A^{-1}$ . $A = \begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & 7 \\ 8 & 9 \end{bmatrix}$

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**72.** For the following pair of matrix verify that $(AB)^{-1} = B^{-1}A^{-1}$ . $A = [2153]$ and $B = [4534]$

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**73.** Let $A=\begin{bmatrix}3&2\\7&5\end{bmatrix}$ and $B=\begin{bmatrix}6&7\\8&9\end{bmatrix}$. Find $(AB)^{-1}$

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**74.** Given $=\begin{bmatrix}2&-3\\-4&7\end{bmatrix}$, compute $A^{-1}$ and show that $2A^{-1}=9I-A$.

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**75.** If $A=\begin{bmatrix}4&5\\2&1\end{bmatrix}$, then show that $A-3I=2\left(I+3A^{-1}\right)$

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76. Find the inverse of the matrix $A = \begin{bmatrix} a & b \\ c & \frac{1+bc}{a} \end{bmatrix}$ and show that $aA^{-1} = (a^2 + bc + 1)I - aA$.

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77. Given $A = \begin{bmatrix} 5 & 0 & 4 \\ 2 & 3 & 2 \\ 1 & 2 & 1 \end{bmatrix}, B^{-1} = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$. Compute $(AB)^{-1}$.

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78. Let $F(\alpha) = [\cos\alpha - \sin\alpha 0 \sin\alpha \cos\alpha 0 0 0 1]$

and $G(\beta) = [\cos\beta 0 \sin\beta 0 1 0 - \sin\beta 0 \cos\beta]$ .

Show that $[F(\alpha)]^{-1} = F(-\alpha)$ (ii)

$[G(\beta)]^{-1} = G(-\beta)$ (iii)

$[F(\alpha)G(\beta)]^{-1} = G(-\beta)F(-\alpha)$ .

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79. If $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ , verify that $A^2 - 4A + I = O$ , where $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ and

$O = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$. Hence, find $A^{-1}$.

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**80.** Show that $A = \begin{bmatrix} -8 & 5 \\ 2 & 4 \end{bmatrix}$ satisfies the equation $A^2 + 4A - 42I = O$. Hence, find $A^{-1}$.

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**81.** If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, show that $A^2 - 5A + 7I = O$. Hence, find $A^{-1}$.

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**82.** If $A = \begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix}$, find $x$ and $y$ such that $A^2 - xA + yI = O$.

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**83.** If $A = \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$, find the value of $\lambda$ so that $A^2 = \lambda A - 2I$. Hence, find $A^{-1}$.

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**84.** Show that $A = \begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix}$ satisfies the equation $x^2 - 3x - 7 = 0$. Thus, find $A^{-1}$

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**85.** Show that $A = \begin{bmatrix} 6 & 5 \\ 7 & 6 \end{bmatrix}$ satisfies the equation $x^2 - 12x + 1 = 0$. Thus, find $A^{-1}$

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**86.** For the matrix $A = [11112 - 32 - 13]$.

Show that $A^3 - 6A^2 + 5A + 11 I_3 = O$.

Hence, find $A^{-1}$ .

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**87.** Show that the matrix, $A = \begin{bmatrix} 1 & 0 & -2 \\ -2 & -1 & 2 \\ 3 & 4 & 1 \end{bmatrix}$ satisfies the equation, $A^3 - A^2 - 3A - I_3 = O$ . Hence, find $A^{-1}$ .

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**88.** If $A = [2 - 11 - 12 - 11 - 12]$ . Verify that $A^3 - 6A^2 + 9A - 4I = O$ and hence find $A^{-1}$

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**89.** If $A = \frac{1}{9}[-8144471-84]$, prove that $A^{-1} = A^T$.

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**90.** If $A = [3-342-340-11]$, show that $A^{-1} = A^3$.

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**91.** If $A = [-120-111010]$ , show that $A^2 = A^{-1}$.

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**92.** Solve the matrix equation $\begin{bmatrix}5 & 4\\1 & 1\end{bmatrix}X = \begin{bmatrix}1 & -2\\1 & 3\end{bmatrix}$, where $X$ is a $2 \times 2$ matrix.

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**93.** Find the matrix $X$ satisfying the matrix equation: $X\begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix} = \begin{bmatrix} 14 & 7 \\ 7 & 7 \end{bmatrix}$.

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**94.** Find the matrix $X$ for which: $\begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix} X \begin{bmatrix} -1 & 1 \\ -2 & 1 \end{bmatrix} = \begin{bmatrix} 2 & -1 \\ 0 & 4 \end{bmatrix}$.

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**95.** Find the matrix $X$ satisfying the equation: $\begin{bmatrix} 2 & 1 \\ 5 & 3 \end{bmatrix} X \begin{bmatrix} 5 & 3 \\ 3 & 2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$.

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**96.** If $A = [122212221]$ , find $A^{-1}$ and prove that $A^2 - 4A - 5I = O$ .

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**97.** If $A$ is a square matrix of order $n$ , prove that $|A\ adj\ A| = |A|^n$ .

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98. If $A^{-1} = [3 - 11 - 156 - 55 - 22]$and $B = [12 - 2 - 1300 - 21]$, find $(AB)^{-1}$.

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99. If $A = \begin{bmatrix} 1 & -230 \\ -14 & -221 \end{bmatrix}$, find $\left(A^T\right)$.

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100. Find the adjoint of the matrix $A = \begin{bmatrix} -1 & -2 & -2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ and hence show that

$A(adj\ A) = |A|\ I_3$ .

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**101.** Find $A^{-1}$ if $A = \begin{vmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{vmatrix}$ and show that

$$A^{-1} = \frac{A^2 - 3I}{2}$$

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**102.** Use elementary column operation C2 $\rightarrow$ C2 -2C1 in the matrix equation

$$\begin{bmatrix} 4 & 2 \\ 3 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix} \begin{bmatrix} 2 & 0 \\ 1 & 1 \end{bmatrix}$$

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**103.** Apply elementary transformation $R_2 \to R_2 - 3R_1$ in the matrix equation $\begin{bmatrix} 11 & -6 \\ 6 & -4 \end{bmatrix} = \begin{bmatrix} 1 & 3 \\ 0 & 2 \end{bmatrix} \begin{bmatrix} 2 & 0 \\ 3 & -2 \end{bmatrix}$

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**104.** Using elementary transformations, find the inverse of the matrix$[1327]$

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105. Using elementary transformations, find the inverse of the matrix $[1327]$

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106. Using elementary row transformation find the inverse of the matrix $A = [3 - 1 - 220 - 13 - 50]$

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**107.** Find the inverse of the matrix $A = \begin{pmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{pmatrix}$ by using elementary row transformations.

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**108.** Find the inverse using elementary row transformations: $[714 - 3]$ (ii) $[5221]$

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**109.** Find the inverse using elementary row transformations: $[16 - 35]$ (ii) $[2513]$

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**110.** Find the inverse using elementary row transformations: $[31027]$

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**111.** Find the inverse using elementary row transformations: $[012123311]$

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**112.** Find the inverse using elementary row transformations: $[20-1510013]$

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**113.** Find the inverse using elementary row transformations: $[231241372]$

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**114.** Find the inverse using elementary row transformations: $[3-342-340-11]$

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**115.** Find the inverse using elementary row transformations: $[12023-11-13]$

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**116.** Find the inverse using elementary row transformations: $[2-13124311]$

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**117.** Find the inverse using elementary row transformations: $[112311231]$

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**118.** Find the inverse using elementary row transformations: $[2-144023-27]$

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**119.** Find the inverse using elementary row transformations: $[30 - 1230041]$

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**120.** Find the inverse using elementary row transformations: $\begin{bmatrix} 1 & 3 & -2 \\ -3 & 0 & 1 \\ 2 & 1 & 0 \end{bmatrix}$

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**121.** Find the inverse using elementary row transformations: $[-112123311]$

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**122.** Write the adjoint of the matrix $A=\begin{bmatrix}-3 & 4\\ 7 & -2\end{bmatrix}$.

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**123.** If $A$ is a square matrix such that $A(adj\ A) = 5I$, where $I$ denotes the identity matrix of the same order. Then, find the value of $|A|$.

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**124.** If $A$ is a square matrix of order 3 such that $|A| = 5$, write the value of $|adj\ A|$.

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**125.** If $A$ is square matrix of order 3 such that $|adj\ A| = 64$, find $|A|$.

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**126.** If $A$ is a non-singular square matrix such that $|A| = 10$, find $|A^{-1}|$

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**127.** If $A, B, C$ are three non-null square matrices of the same order, write the condition on $A$ such that $AB = AC \Rightarrow B = C$.

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**128.** If $A$ is a non-singular square matrix such that $A^{-1} = \begin{bmatrix} 5 & 3 \\ -2 & -1 \end{bmatrix}$, then find $\left(A^T\right)^{-1}$.

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**129.** If $adj\ A = \begin{bmatrix} 2 & 3 \\ 4 & -1 \end{bmatrix}$ and $adj\ B = \begin{bmatrix} 1 & -2 \\ -3 & 1 \end{bmatrix}$, find $adj\ AB$.

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**130.** If A is a symmetric matrix, write whether $A^T$ is symmetric or skew-symmetric.

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**131.** If A is a square matrix of order 3 such that $|A| = 3$, then write the value of $|adjA|$

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**132.** If A is a square matrix of order 3 such that

$|A|$ =3 then find the value of |(a d j A)|

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**133.** If A is a square matrix of order 3 such that

$|A| = 2$, then write the value of $|(adjA)|$

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**134.** If $A$ is a square matrix, then write the matrix $adj\left(A^T\right) - (adj\ A)^T$.

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**135.** Let $A$ be a $3 \times 3$ square matrix such that $|A|$ = 3 Write the value of $|adj A|$.

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**136.** If $A$ is a non-singular symmetric matrix, write whether $A^{-1}$ is symmetric or skew-symmetric.

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**137.** If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then find the value of $|A|$.

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138. If $A$ is an invertible matrix such that $|A^{-1}| = 2$, find the value of $|A|$.

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139. If $A$ is a square matrix such that $A(adj\ A) = \begin{bmatrix} 5 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 5 \end{bmatrix}$, then write the value of $|adj\ A|$.

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**140.** If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ be such that $A^{-1} = kA$, then find the value of $k$.

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**141.** Let $A$ be a square matrix such that $A^2 - A + I = O$, then write $A^{-1}$ in terms of $A$.

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**142.** If $A_{ij}$ is the cofactor of the element $a_{ij}$ of the determinant $\begin{bmatrix} 2 & -3 \\ -7 & 6 \end{bmatrix}$, then write the value of $a_{22} \cdot A_{22} \cdot$

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**143.** Find the inverse of the matrix $\begin{bmatrix} 3 & -2 \\ -7 & 5 \end{bmatrix}$.

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144. Find the inverse of the matrix $\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$.

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145. If $A = \begin{bmatrix} 1 & -3 \\ 2 & 0 \end{bmatrix}$, write $adj\ A$.

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146. If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, find $adj\ (AB)$.

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**147.** If $A = \begin{bmatrix} 3 & 1 \\ 2 & -3 \end{bmatrix}$, then find $|adj\ A|$.

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**148.** If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$, write $A^{-1}$

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**149.** Write $A^{-1}$ for $A = \begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$

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150. Use elementary column operation $C_2 \to C_2 + 2C_1$ in the following matrix equation : $\begin{bmatrix} 2 & 1 \\ 2 & 0 \end{bmatrix} = \begin{bmatrix} 3 & 1 \\ 2 & 0 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ -1 & 1 \end{bmatrix}$

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151. If $A$ is an invertible matrix, then which of the following is not true $\left(A^2\right)^{-1} = \left(A^{-1}\right)^2$ (b) $\left|A^{-1}\right| = |A|^{-1}$ (c) $\left(A^T\right)^{-1} = \left(A^{-1}\right)^T$ (d) $|A| \neq 0$

**152.** If $A$ is an invertible matrix of order 3, then which of the following is not true (a) $|adj\ A| = |A|^2$ (b) $\left(A^{-1}\right)^{-1} = A$ (c) If $BA = CA$, then $B \neq C$, where $B$ and $C$ are square matrices of order 3 (d) $(AB)^{-1} = B^{-1}A^{-1}$, where $B = \left(\left[b_{ij}\right]\right)_{3 \times 3}$ and $|B| \neq 0$

153. If $A=\begin{bmatrix}3 & 4\\ 2 & 4\end{bmatrix}$, $B=\begin{bmatrix}-2 & -2\\ 0 & -1\end{bmatrix}$, then $(A+B)^{-1}$ (a) is a skew-symmetric matrix (b) $A^{-1}+B^{-1}$ (c) does not exist (d) none of these

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154. If $A=\begin{bmatrix}a & b\\ c & d\end{bmatrix}$, then $adj\,A$ is (a) $\begin{bmatrix}-d & -b\\ -c & a\end{bmatrix}$ (b) $\begin{bmatrix}d & -b\\ -c & a\end{bmatrix}$ (c) $\begin{bmatrix}d & b\\ c & a\end{bmatrix}$ (d) $\begin{bmatrix}d & c\\ b & a\end{bmatrix}$

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**155.** If $A$ is a singular matrix, then $adjA$ is $a$. Singular $b$. non singular $c$. symmetric $d$. not defined

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**156.** If A, B are two $n \times n$ non-singular matrices, then (1) AB is non-singular (2) AB is singular (3) $(AB)^{-1} = A^{-1}B^{-1}$ (4) $(AB)^{-1}$ does not exist

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**157.** If $A = \begin{bmatrix} a & 0 \\ 0 & a \end{bmatrix}$, then the value of $|adj\ A|$ is ?

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**158.** If $A = \begin{bmatrix} 1 & 2 \\ -1 & 1 \end{bmatrix}$, then $\det(adj\ A))$ is ?

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**159.** If B is a non-singular matrix and A is a square matrix, then $\det(B^{-1}AB)$ is equal to

(A) $\det(A^{-1})$ (B) $\det(B^{-1})$ (C) $\det(A)$ (D) $\det(B)$

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160. For any $2 \times 2$ matrix, if $A\,(adj\ A) = \begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$, then $|A|$ is equal to

(a) 20 (b) 100 (c) 10 (d) 0

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**161.** If $A^5 = O$ such that $A^n \neq I$ for $1 \leq n \leq 4$, then $(I - A)^{-1}$ is equal to

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**162.** If $A$ satisfies the equation $x^3 - 5x^2 + 4x + \lambda = 0$, then $A^{-1}$ exists if (a) $\lambda \neq 1$ (b) $\lambda \neq 2$ (c) $\lambda \neq -1$ (d) $\lambda \neq 0$

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**163.** If for the matrix $A$, $A^3 = I$ , then $A^{-1} =$

(a)$A^2$ (b) $A^3$ (c) $A$ (d) none of these

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**164.** If $A and B$ are two square matrices such that $B = -A^{-1}BA, then(A+B)^2$ is equal to $A^2 + B^2$ b. $O$ c. $A^2 + 2AB + B^2$ d. $A + B$

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**165.** If $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$, then $A^5$= (a) $5A$ (b) $10A$ (c) $16A$ (d) $32A$

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**166.** For non-singular square matrix $A,\ B\ and\ C$ of the same order then, $\left(AB^{-1}C\right)^{-1} =$ (a) $A^{-1}BC^{-1}$ (b) $C^{-1}B^{-1}A^{-1}$ (c) $CBA^{-1}$ (d) $C^{-1}\ B\ A^{-1}$

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167. The matrix $\begin{bmatrix} 5 & 1 & 0 \\ 3 & -2 & -4 \\ 6 & -1 & -2b \end{bmatrix}$ is a singular matrix, if the value of $b$ is ?

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168. If $d$ is the determinant of a square matrix $A$ of order $n$ , then the determinant of its adjoint is $d^n$ (b) $d^{n-1}$ (c) $d^{n+1}$ (d) $d$

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**169.** If $A$ is a matrix of order 3 and $|A| = 8$ , then $|adj\ A| =$ (a) 1 (b) 2 (c) $2^3$ (d) $2^6$

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**170.** If $A^2 - A + I = 0$, then the inverse of A is:

(A) $A + I$ (B) $A$ (C) $A - I$ (D) $I - A$

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**171.** If $A$ and $B$ are invertible matrices, which of the following statement is not correct. $adj\ A = |A|A^{-1}$ (b) $\det\left(A^{-1}\right) = (\det A)^{-1}$ (c) $(A+B)^{-1} = A^{-1} + B^{-1}$ (d) $(AB)^{-1} = B^{-1}A^{-1}$

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**172.** If A is a square matrix such that $A^2 = I$, then $A^{-1}$ is equal to (i) I (ii) 0 (iii) A (iv) I+A

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**173.** Let $A = \begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$ and $X$ be a matrix such that $A = BX$ , then $X$ is equal to (a) $\frac{1}{2}\begin{bmatrix} 2 & 4 \\ 3 & -5 \end{bmatrix}$ (b) $\frac{1}{2}\begin{bmatrix} -2 & 4 \\ 3 & 5 \end{bmatrix}$ (c) $\begin{bmatrix} 2 & 4 \\ 3 & -5 \end{bmatrix}$ (d) none of these

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**174.** If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$, then find |A|

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**175.** If $A = \frac{1}{3}\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ x & 2 & y \end{bmatrix}$ satisfies $A^T A = I$,

then $x + y =$ (a) 3 (b) 0 (c) -3 (d) 1

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**176.** If A= $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 0 & 1 \\ a & b & 2 \end{bmatrix}$ , then $aI + bA + 2A^2$

equals (a) $A$ (b) -$A$ (c) $ab$ $A$ (d) none of these

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177. If $\begin{bmatrix} 1 & -\tan\theta \\ \tan\theta & 1 \end{bmatrix}\begin{bmatrix} 1 & \tan\theta \\ -\tan\theta & 1 \end{bmatrix}^{-1} = \begin{bmatrix} a & -b \\ b & a \end{bmatrix}$, then $a = 1, \ b = 0$ (b) $a = \cos 2\theta, \ b = \sin 2\theta$ (c) $a = \sin 2\theta, \ b = \cos 2\theta$ (d) none of these

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178. If a matrix $A$ is such that $3A^3 + 2A^2 + 5A + I = 0$, then $A^{-1}$ is equal to

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**179.** If A is an invertible matrix of order 2, then det $\left(A^{-1}\right)$ is equal to(a) det (A) (B) $\frac{1}{\det(A)}$ (C) 1

(D) 0

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**180.** If $A = \begin{bmatrix} 2 & -1 \\ 3 & -2 \end{bmatrix}$, then $A^n = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, if (a) $n$ is an even natural number (b) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, if $n$ is an odd natural number (c) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, if $n \in N$ (d) none of these

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**181.** If $x$, $y$, $z$ are non-zero real numbers, then the inverse of the matrix $A = \begin{bmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{bmatrix}$, is

(a) $\begin{bmatrix} x^{-1} & 0 & 0 \\ 0 & y^{-1} & 0 \\ 0 & 0 & z^{-1} \end{bmatrix}$ (b) $xyz\begin{bmatrix} x^{-1} & 0 & 0 \\ 0 & y^{-1} & 0 \\ 0 & 0 & z^{-1} \end{bmatrix}$ (c) $\frac{1}{xyz}\begin{bmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{bmatrix}$ (d) $\frac{1}{xyz}\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

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